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SAMSUNG ELECTRONICS

Product Information

Issued Date : Apr. 08, 2005

SAMSUNG TFT-LCD

MODEL NO. : LTA320W2-L03

Note _____

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Any Modification of Spec is not allowed without SEC's permission.

Senior Engineer : J. H. Park

PREPARED BY : AMLCD Technical Customer Service Team

Samsung Electronics Co . , LTD.

wise view™ SAMSUNG TFT-LCD

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* Revision History

No	Date	Page	Before change	After change	Remark
1.0	2004.12.24	All	First issued		
	2005.04.08	18~19	outline dimension		changed

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General Description

* Description

LTA320W2-L03 is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFTs as a switching devices. This model is composed of a TFT LCD panel, a driver circuit and a back-light system. The resolution of a 32.0" contains 1366 x 768 pixels and can display up to 16.7 million colors with wide viewing angle of 85° or higher in all directions.

* Features

- High contrast ratio, high aperture structure
- APVA(Advanced Patterned Vertical Align) mode
- Wide viewing angle(±170°)
- High speed response
- WXGA(1366 x 768 pixels) resolution (16:9)
- Low Power consumption
- Direct Type 16 CCFL(Cold Cathode Fluorescent Lamp)
- DE only mode
- LVDS(Low-Voltage Differential Signal) interface.(1pixel/clock)

* Applications

Home-alone Multimedia TFT-LCD TV
Display terminals for AV application products
High Definition TV (HD TV)

* General information

Items	Specification	Unit	Note
Display area	697.6845(H) × 392.256(V)	mm	
Outline Dimension	760.0(H) × 450.0(V) × 50.0(D)	mm	Typical Value
Driver element	a-Si TFT active matrix		
Display colors	16.7M(true)	colors	16,777,216
Number of pixels	1366 x 768	pixel	16:9
Pixel pitch	0.51075(H) × 0.51075(W)	mm	RGB Vertical Stripe
Display mode	Normally Black		
Power Consumption	110.5Watt (BLU 103, Panel 7.5)	Watt	@Typical Luminance, 1hr Aging
Surface treatment	Haze 44% , Hard-Coating (3H)		Conductive pol
Weight	6500 (Typ), 7000 (Max)	g	

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1. Absolute Maximum Ratings

1.1 Absolute ratings of environment

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	TSTG	-20	65	℃	(1)
Operating temperature	TOPR	0	50	℃	(1)
(Ambient temperature)	Tsur	0	65	℃	(2)
Shock (non - operating)	Snop	-	50	G	(3),(5)
Vibration (Non - operating)	Vnop	-	1.5	G	(4),(5)

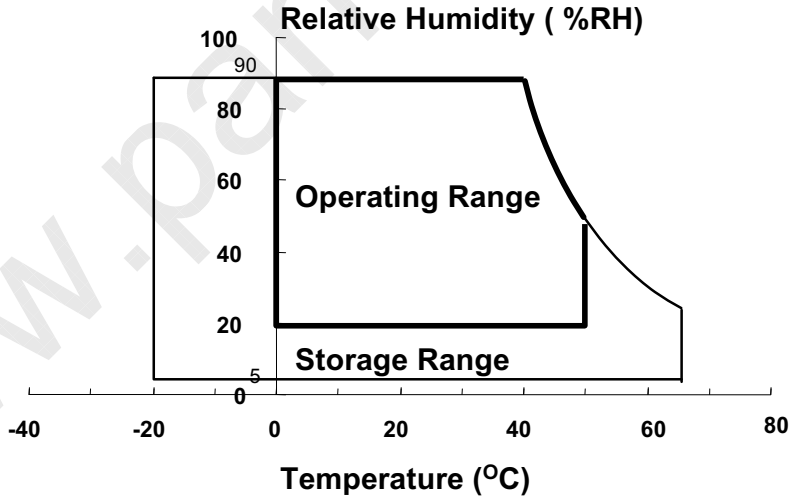
Note (1) Temperature and relative humidity range are shown in the figure below.
93.8 % RH Max. (40 °C ≥ Ta)
Maximum wet-bulb temperature at 39 °C or less. (Ta > 40 °C) No condensation.

(2) Abnormal visual problems by panel surface temperature can be occurred in specific range. But materials(ex : polarizer) are not damaged permanently in this range, Tsur.

(3) 20ms, sine wave, 1 time for ±X, ±Y, ±Z axis

(4) 10～300Hz/1.5G
(11min/cycle, 30min for X,Y,Z axis)

(5) At testing Vibration and Shock, the fixture in holding the Module to be tested have to be hard and rigid enough so that the Module would not be twisted or bent by the fixture.



1.2 ELECTRICAL ABSOLUTE RATINGS

(Vss = GND = 0 V)

Item		Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	LCD Module	VDD	Vss-0.5	6.5	V	(1)
	Inverter	VCC	Vss-0.5	25.2	V	

NOTE (1) Within Ta (25 ± 2 °C)

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2. Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (1).

◆ Measuring equipment : TOPCON BM-5A , BM-7, PHOTO RESEARCH PR650

* Ta = 25 ± 2°C , V_{DD}=5.0V, fv= 60Hz, f_{DCLK}=75 MHz, I_L = 5.0mA$_{rms}$

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center of screen)		C/R	Normal ϕ = 0 θ = 0 Viewing Angle	700	1000	-		(3) BM-5A
Response Time	Rising	Tr		-	8	16	msec	(4) BM-7
	Falling	Tf		-	6	9		
	G to G	Tg		-	8	-		
Luminance of White (Center of screen)		YL		450	500	-	cd/m2	(5) BM-5A
Color Chromaticity (CIE 1931)	Red	Rx		TYP. -0.03	0.642	TYP. +0.03		(6) PR650
		Ry			0.332			
	Green	Gx			0.276			
		Gy			0.600			
	Blue	Bx			0.144			
		By			0.061			
	White	Wx			0.278			
		Wy			0.290			
Color Temperature		k		-	10000	-		
Viewing Angle	Hor.	θ L	C/R≥10	75	85	-	Degrees	(7) BM-5A
		θ R		75	85	-		
	Ver.	ϕ H		75	85	-		
		ϕ L		75	85	-		
Brightness Uniformity (9 points)		Buni		-	-	25	%	(8) BM-5A

Note 1) Test Equipment Setup

After stabilizing and leaving the panel alone at a given temperature for 30 min ,the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. 30 min after lighting the back-light. This should be measured in the center of screen.

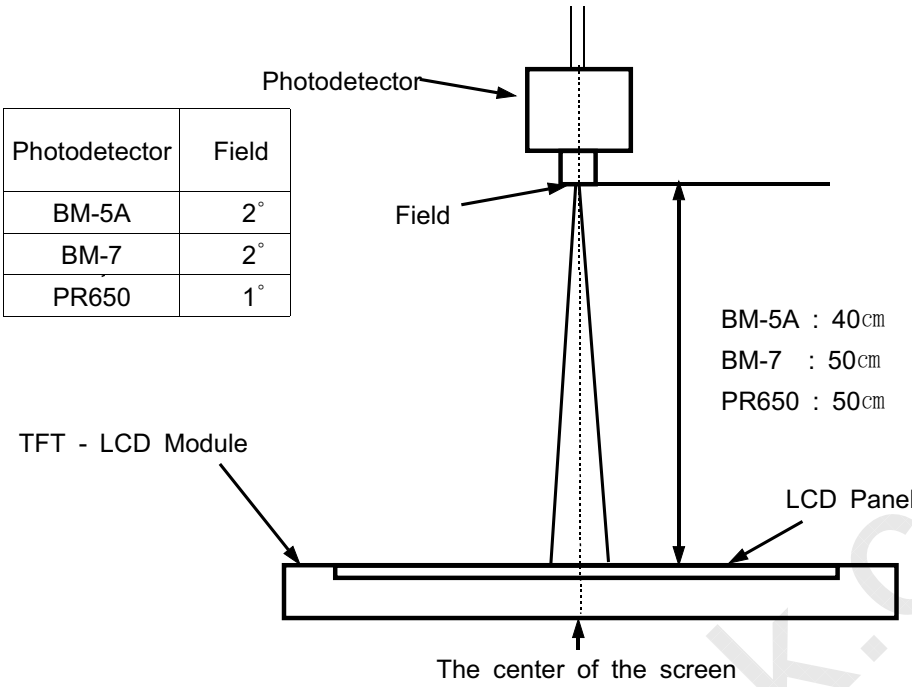
A single lamp current : 5.0mA

Environment condition : Ta = 25 ± 2 °C

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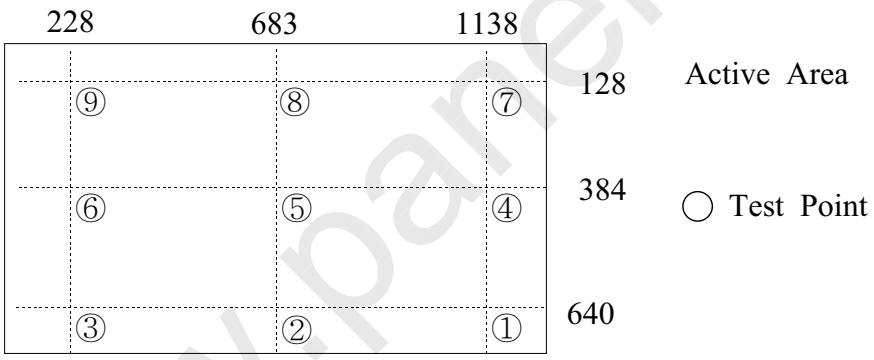
Product Information

Photodetector	Field
BM-5A	2°
BM-7	2°
PR650	1°



Optical Measuring Equipment Setup

Note 2) Definition of test point



Note 3) Definition of Contrast Ratio (C/R) : Ratio of gray max (Gmax) & gray min (Gmin) at the center point(5) of the panel

$$CR = \frac{G\max}{G\min}$$

Gmax : Luminance with all pixels white

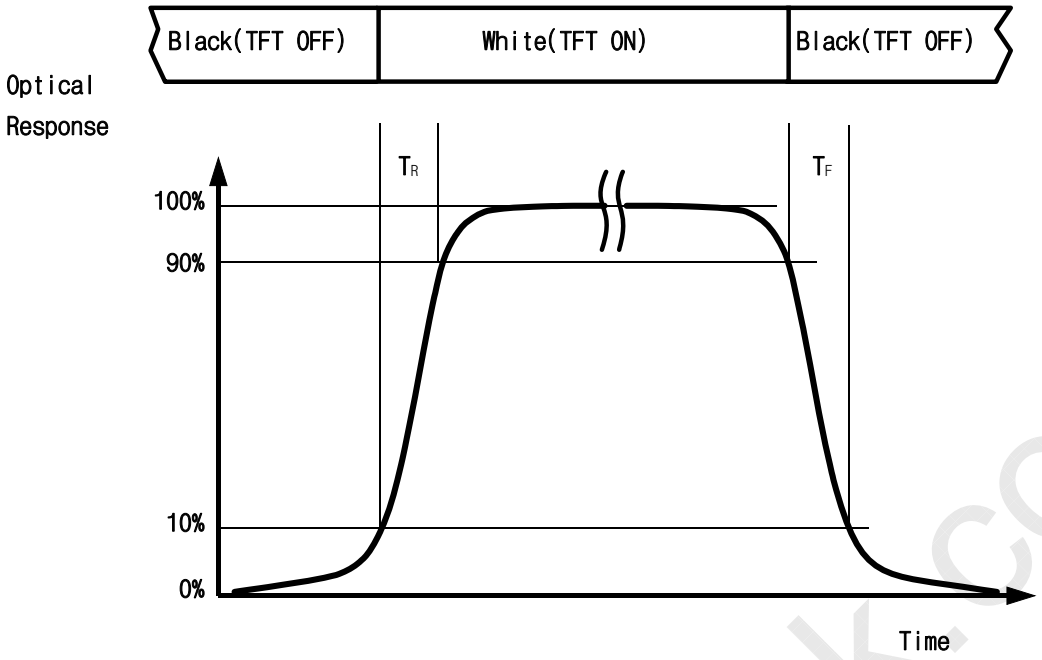
Gmin : Luminance with all pixels black

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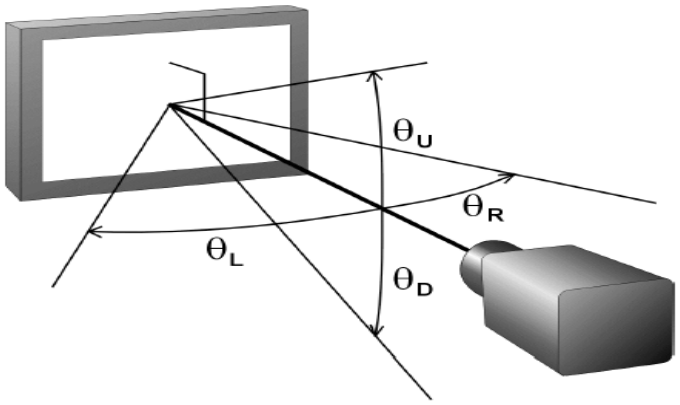
Note 4) Definition of Response time : Sum of Tr ,Tf



Note 5) Definition of Luminance of White : Luminance of white at center point(5).

Note 6) Definition of Color Chromaticity (CIE 1931)
Color coordinate of Red , Green , Blue & White at center point(5).

Note 7) Definition of Viewing Angle : Viewing angle range (CR≥10)



Note 8) Definition of 9 points brightness uniformity

$$Buni = 100 * \frac{(B\max - B\min)}{B\max}$$

Bmax : Maximum brightness
Bmin : Minimum brightness

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3. Electrical Characteristics

3.1 TFT LCD MODULE

Ta = 25°C

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V_{DD}	4.5	5.0	5.5	V	(1)
Power Consumption	(a)Black	I_{DD}	-	1000	-	mA	(2),(3)
	(b)White		-	1250	-	mA	
	(c)N-Pattern		-	1500	2000	mA	
	Power Consumption	Pc	-	7.5	10	Watt	Module Only
Vsync Frequency		f_V	48	60	66	Hz	
Hsync Frequency		f_H	44	47.3	53	kHz	
Main Clock Frequency		f_{DCLK}	65	75	82	MHz	
Rush Current		I_{RUSH}	-	-	4	A	(4)

Note (1) Main clock frequency is the value which is measured at the LVDS input transmitter.

(2) f_V=60Hz, f_{DCLK} =75MHz, V_{DD} = 5.0V, DC Current.

(3) Power dissipation check pattern(LCD Module only)

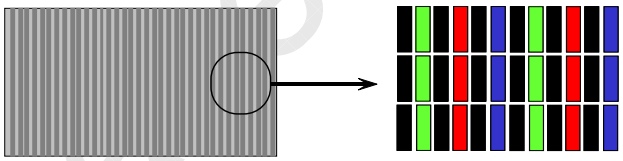
(a) Black Pattern



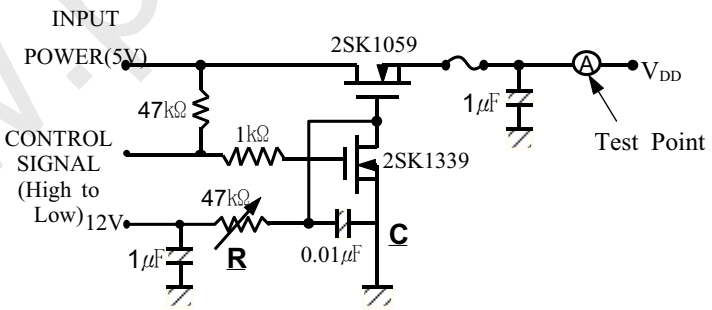
(b) White Pattern



(C) N-pattern



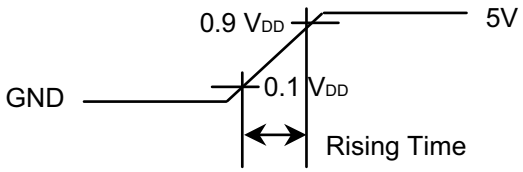
(4) Measurement Conditions (Rising time =470μs)



Note : Control Signal : High(+5V) -->Low(Ground)

All Signal lines to panel except for power 5V : Ground

The rising time of supplied voltage is controlled to 470us by R and C value.



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3.2 BACK-LIGHT UNIT

The back-light system contains 16 direct-lighting type CCFTs (Cold Cathode Fluorescent Tube)

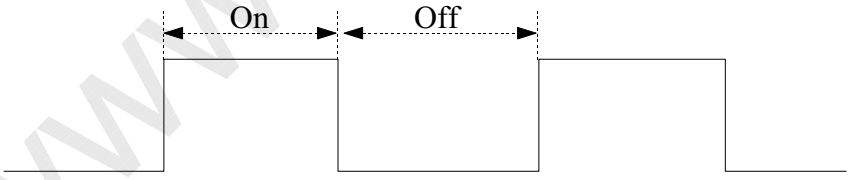
- Life time (Hr) of a lamp, 50,000hours, is defined as the time in which it continues to operate under the condition of Ta = 25±2°C and Typical Luminance for a lamp until the brightness becomes 50% or lower than it's original value.

3.2.1 Inverter Input Condition & Specification

Items	Symbol	Conditions	Specifications			Unit	Note
			Min.	Typ.	Max.		
Input Voltage	Vin	-	21.6	24	26.4	V	Ta=25℃
Input Current	Pin	Vadim=1.5V(5mA)	-	5.4	-	Adc	After 2hr Warm up
Output Current	Io,max	Vadim=1.5V	4.5	5.0	5.5	mArms	
	Io,min	Vadim=0V	3.5	4.0	4.5		
Power Consumption	Pc	Typ Luminance	-	103	130	Watt	(1)
Backlight On/Off Control	On	ON/OFF=High	2.4	-	5.25	V	
	Off	ON/OFF=Low	0	-	0.8	V	
Analog Dimming	A_{DIM}	Min. Luminance	0			V	
		Max. Luminance	3.3				
PWM Frequency	Fpwm	Vin=24, Vadim=3.3V	120	180	240	Hz	
PWM Dimming Range	PMD	Vin=24, Vadim=1.5V	30	-	100	%	(2)

Note(1) Power Consumption is measured when 500 of Luminance which is the typ. luminance. Max Value of the Power Consumption is measured at initial turn on of the Backlight.

Note(2) High-duty = On/(On+Off) * 100

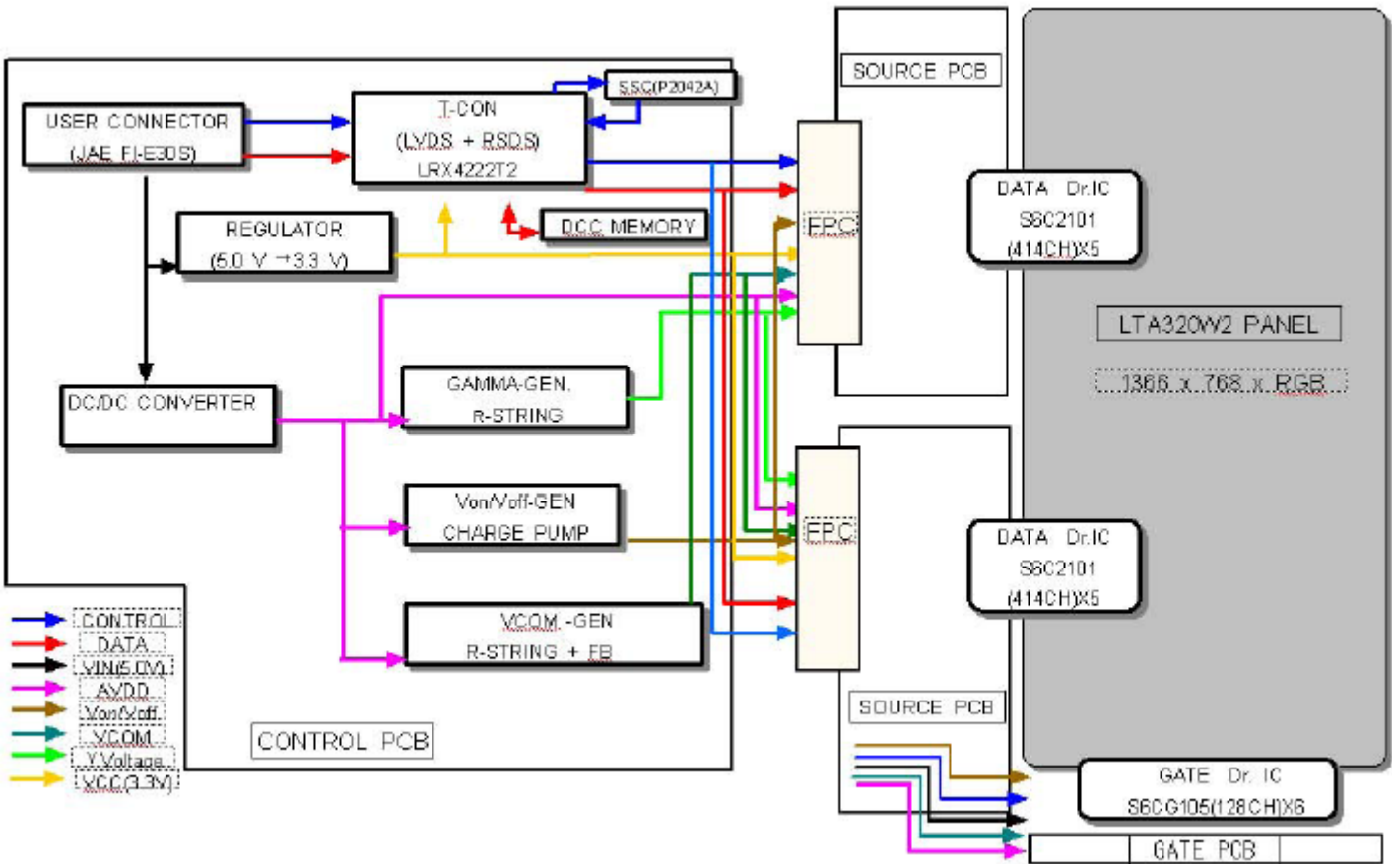


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4. Block Diagram

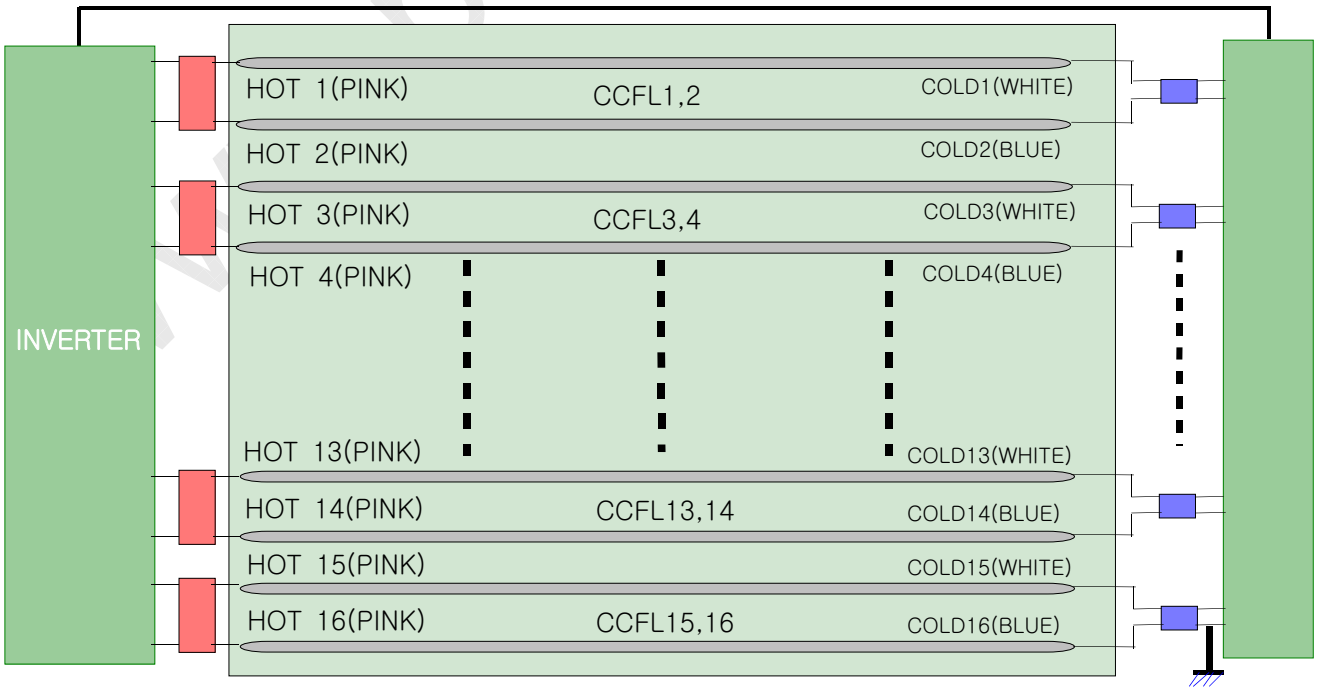
4.1 TFT LCD MODULE



4.2 BACK-LIGHT UNIT

HOT : HIGH VOLTAGE (Part NO. : BHCR-02VS-2 (JST))

COLD : GROUND (Part NO. : C-1612472 (AMP))



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5. Input Terminal Pin Assignment

5.1. Input Signal & Power : Connector FI-E30S (JAE)

No.	Signal	No.	Signal
1	N.C.*	16	GND
2	N.C.*	17	Rx3-
3	N.C.*	18	Rx3+
4	GND	19	GND
5	Rx0-	20	N.C.*
6	Rx0+	21	**LVDS OPTION ****
7	GND	22	N.C.*
8	Rx1-	23	GND
9	Rx1+	24	GND
10	GND	25	GND
11	Rx2-	26	Vdd (+5V dc)
12	Rx2+	27	Vdd (+5V dc)
13	GND	28	Vdd (+5V dc)
14	RxCLK-	29	Vdd (+5V dc)
15	RxCLK+	30	Vdd (+5V dc)

* N.C : Do not Connect. THESE PINS ARE ONLY FOR SEC INTERNAL OPERATIONS.

** LVDS OPTION : IF THIS PIN : HIGH (3.3 V) → NORMAL NS LVDS FORMAT

OTHERWISE : LOW (GND) OR OPEN(NC) → JEIDA LVDS FORMAT

Sequence : On = Vdd(T1) ≥ LVDS Option ≥ Interface Signal(T2)

OFF = Interface Signal(T3) ≥ LVDS Option ≥ Vdd

5.2. Inverter Input Pin Configuration

Connector :S14B-PH-SM3-TB(JST)

PIN NO.	PIN Configuration (FUNCTION)
1	AWG24 24 V
2	AWG24 24 V
3	AWG24 24 V
4	AWG24 24 V
5	AWG24 24 V
6	AWG24 GND
7	AWG24 GND
8	AWG24 GND
9	AWG24 GND
10	AWG24 GND
11	Status(Normal Operation : GND, Error(Shut-down) : Floating)
12	BACKLIGHT ON ~ OFF / ON:2.4 - 5.25 V, OFF: 0 - 0.8 V
13	Analog Dimmer / GND Min. Lum ~ 3.3V DC Max. Lum
14	PWM Dimmer / PWM Duty(ADIM=3.3V) : 30 ~100%

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5.3 LVDS Interface

-LVDS Receiver : Tcon (LVDS Rx merged)

-Pixel data (single data)

	LVDS pin	JEIDA -DATA	Normal -DATA
TxOUT/RxIN0	TxIN/RxOUT0	R2	R0
	TxIN/RxOUT1	R3	R1
	TxIN/RxOUT2	R4	R2
	TxIN/RxOUT3	R5	R3
	TxIN/RxOUT4	R6	R4
	TxIN/RxOUT6	R7	R5
	TxIN/RxOUT7	G2	G0
TxOUT/RxIN1	TxIN/RxOUT8	G3	G1
	TxIN/RxOUT9	G4	G2
	TxIN/RxOUT12	G5	G3
	TxIN/RxOUT13	G6	G4
	TxIN/RxOUT14	G7	G5
	TxIN/RxOUT15	B2	B0
	TxIN/RxOUT18	B3	B1
TxOUT/RxIN2	TxIN/RxOUT19	B4	B2
	TxIN/RxOUT20	B5	B3
	TxIN/RxOUT21	B6	B4
	TxIN/RxOUT22	B7	B5
	TxIN/RxOUT24	HSYNC	HSYNC
	TxIN/RxOUT25	VSYNC	VSYNC
	TxIN/RxOUT26	DEN	DEN
TxOUT/RxIN3	TxIN/RxOUT27	R0	R6
	TxIN/RxOUT5	R1	R7
	TxIN/RxOUT10	G0	G6
	TxIN/RxOUT11	G1	G7
	TxIN/RxOUT16	B0	B6
	TxIN/RxOUT17	B1	B7
	TxIN/RxOUT23	RESERVED	RESERVED

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5.4 Input Signal,Basic Display Colors and Gray Scale of Each Color

COLOR	DISPLAY	DATA SIGNAL																								GRAY SCALE LEVEL
		RED								GREEN								BLUE								
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7	
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	DARK	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
	↑	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~R252
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R253
	LIGHT	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R254
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R255
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	DARK	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
	↑	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~G252
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G253
	LIGHT	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G254
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G255
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	DARK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B1
	↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	B2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~B252
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	B253
	LIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	B254
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	B255

Note) Definition of Gray :

Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)

Input Signal : 0 = Low level voltage, 1 = High level voltage

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6. Interface Timing

6.1 Timing Parameters (DE only mode)

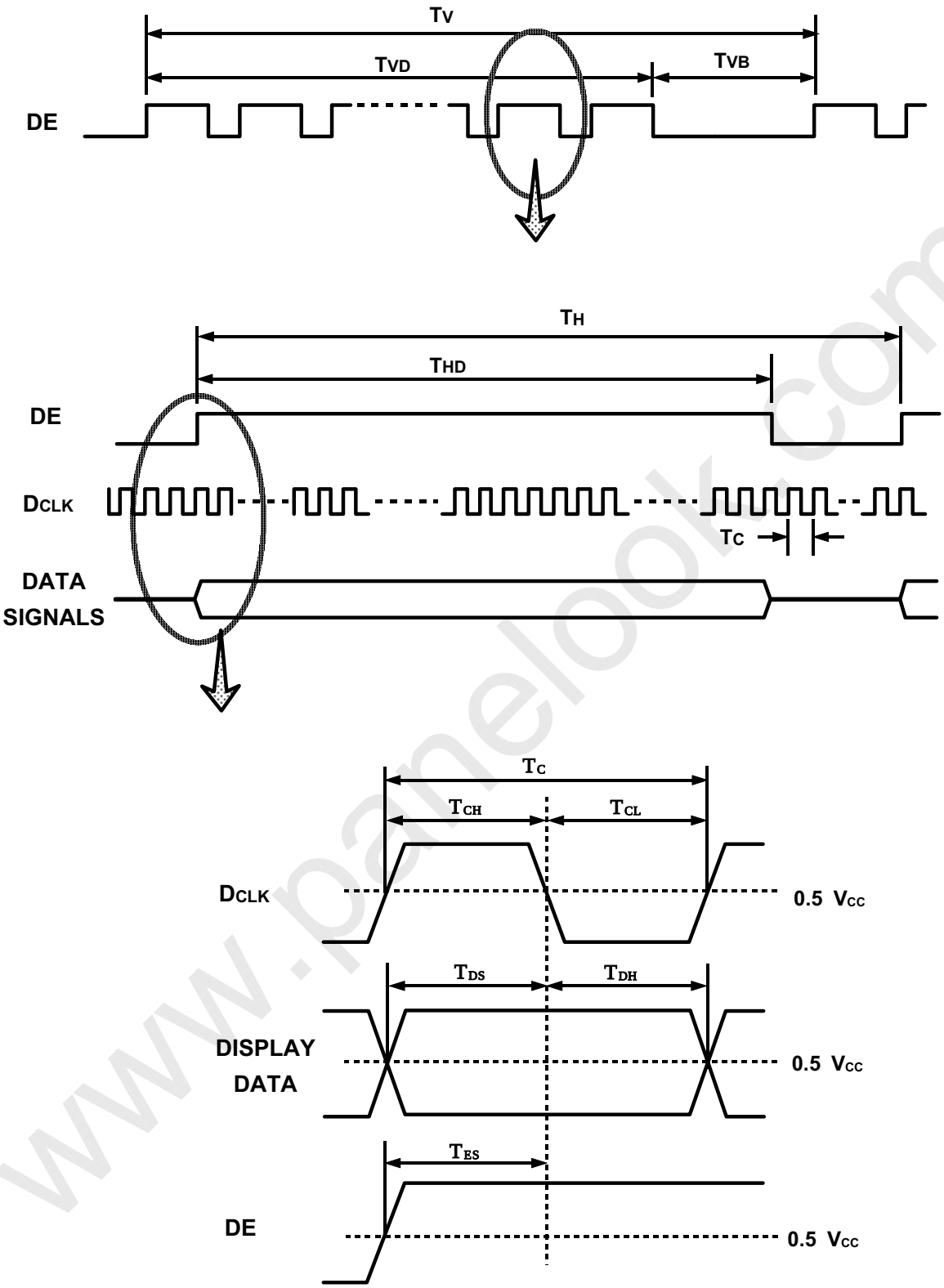
SIGNAL	ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Clock	Frequency	1/TC	65	75	82	MHz	
Hsync		Fh	44	48	53	KHz	
Vsync		Fv	48	60	66	Hz	
Vertical Active Display Term	Display Period	TVD	-	768	-	lines	
	Vertical Total	TV	773	838	1200	lines	
Horizontal Active Display Term	Display Period	THD	-	1366	-	clocks	
	Horizontal Total	TH	1570	1600	1700	clocks	

Note) This product is DE only mode. The input of Hsync & Vsync signal does not have an effect on normal operation.

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6.2 Timing diagrams of interface signal (DE only mode)



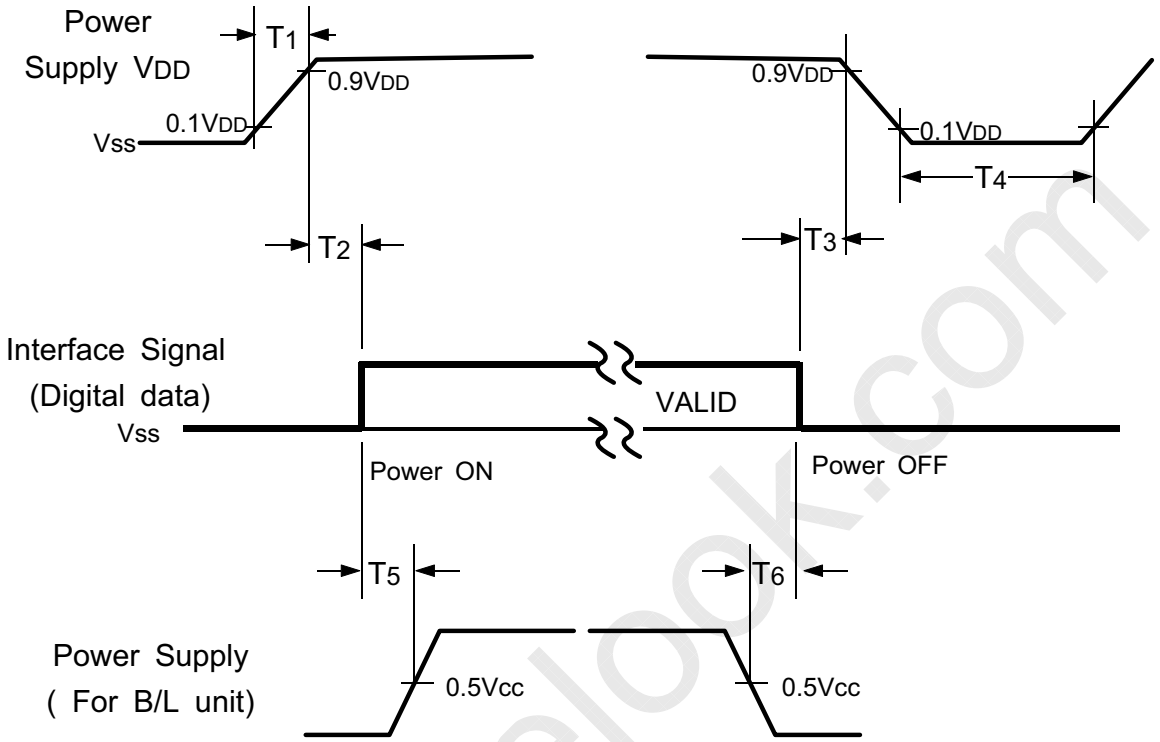
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6.3 Power ON/OFF Sequence

: To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.



Parameter	Value			Units
	Min	Typ	Max	
T1	0	-	30	ms
T2	0	-	50	ms
T3	0	-	50	ms
T4	300	-	-	ms
T5	1000	-	-	ms
T6	100	-	-	ms

NOTE.

(1)The supply voltage of the external system for the module input should be the same as the definition of VDD.

(2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become abnormal screen.

(3) In case of VDD = off level, please keep the level of input signals on the low or keep a high impedance.

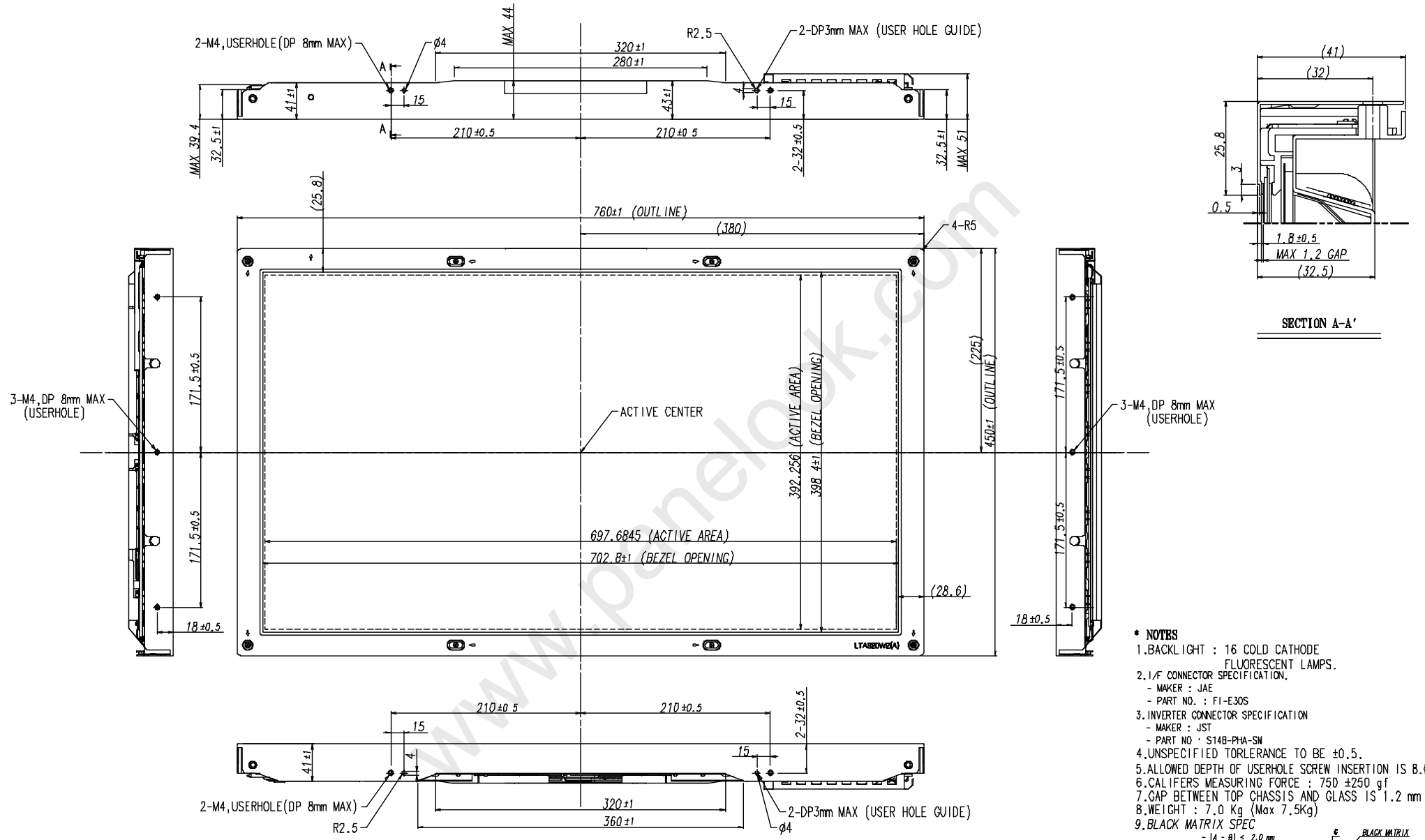
(4) T4 should be measured after the module has been fully discharged between power off and on period.

(5) Interface signal shall not be kept at high impedance when the power is on.

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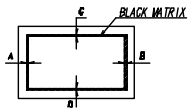
NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	SPEC NO	REMARK
1	OULINE DIMENSION	-	LTA320W2-L03-00R7	1		



SECTION A-A'

* NOTES

1. BACKLIGHT : 16 COLD CATHODE FLUORESCENT LAMPS.
2. I/F CONNECTOR SPECIFICATION.
   - MAKER : JAE
   - PART NO. : FI-E30S
3. INVERTER CONNECTOR SPECIFICATION
   - MAKER : JST
   - PART NO : S14B-PHA-SM
4. UNSPECIFIED TORLERANCE TO BE ±0.5.
5. ALLOWED DEPTH OF USERHOLE SCREW INSERTION IS 8.0 MAX
6. CALIFERS MEASURING FORCE : 750 ±250 gf
7. GAP BETWEEN TOP CHASSIS AND GLASS IS 1.2 mm MAX
8. WEIGHT : 7.0 Kg (Max 7.5Kg)
9. *BLACK MATRIX SPEC*
   - |A - B| ≤ 2.0 mm
   - |C - D| ≤ 2.0 mm



REVISION

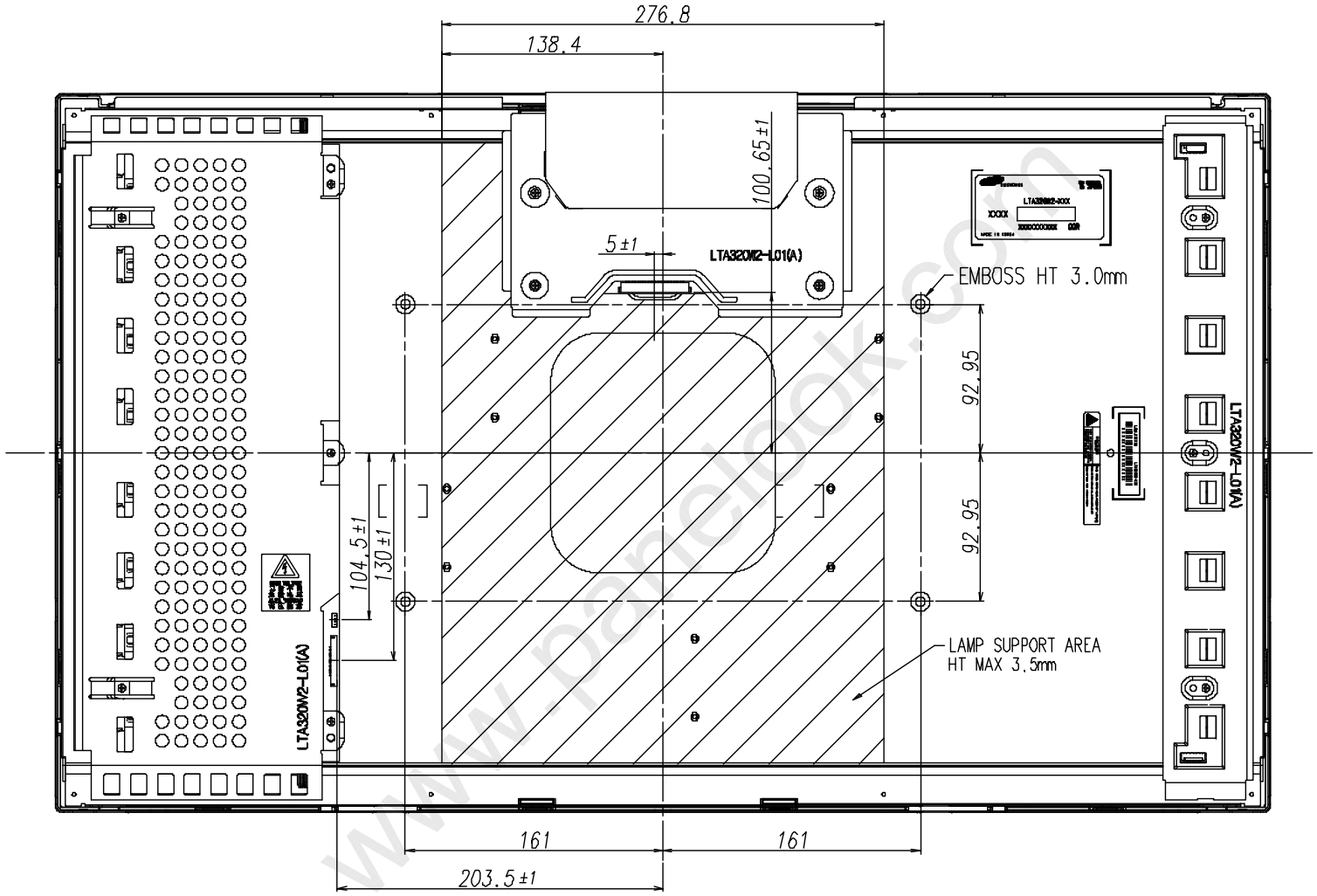
GENERAL TOLERANCE			
STEP	LEVEL 1	LEVEL 2	LEVEL 3
0 < X <= 4	±0.05	±0.1	±0.2
4 < X <= 16	±0.08	±0.15	±0.3
16 < X <= 64	±0.12	±0.25	±0.5
64 < X <= 256	±0.25	±0.4	±0.8

REV	DATE	DESCRIPTION OF REVISION				REASON	CHK'D BY
UNIT	mm	DRA'N BY	DES'D BY	CHK'D BY	APP'D BY		
SCALE	1/1		V.J.KIM		J.H.CHUN	MODEL NAME	LTA320W2-L03-00R7
TOLERANCE							
LEVEL	3		05.03.29		05.03.25	PART/SHEET NAME	OUTLINE DIM.(FRONT) SHEET 1/2
					SPEC. NO		
		SAMSUNG ELECTRONICS				CODE NO	- VER 000

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NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	SPEC NO	REMARK
	OUTLINE DIMENISON	-	LTA320W2-L03-00R7	1		



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REVISION

GENERAL TOLERANCE			
STEP	LEVEL 1	LEVEL 2	LEVEL 3
0 < X ≤ 4	±0.05	±0.1	±0.2
4 < X ≤ 16	±0.08	±0.15	±0.3
16 < X ≤ 64	±0.12	±0.25	±0.5
64 < X ≤ 256	±0.25	±0.4	±0.8

REV	DATE	DESCRIPTION OF REVISION	REASON	CHG'D BY

UNIT	mm	DRA'N BY	DES'D BY	CHK'D BY	APP'D BY
SCALE	1/2		W.J.KIN		J.H.CHUN
TOLERANCE		.	05.03.25		05.03.25

SAMSUNG ELECTRONICS

SPEC NO

MODEL NAME	LTA320W2-L03-00R7		
PART/SHEET NAME	OUTLINE DIMENISON	SHEET	2/2
CODE NO.	-	VER.	000

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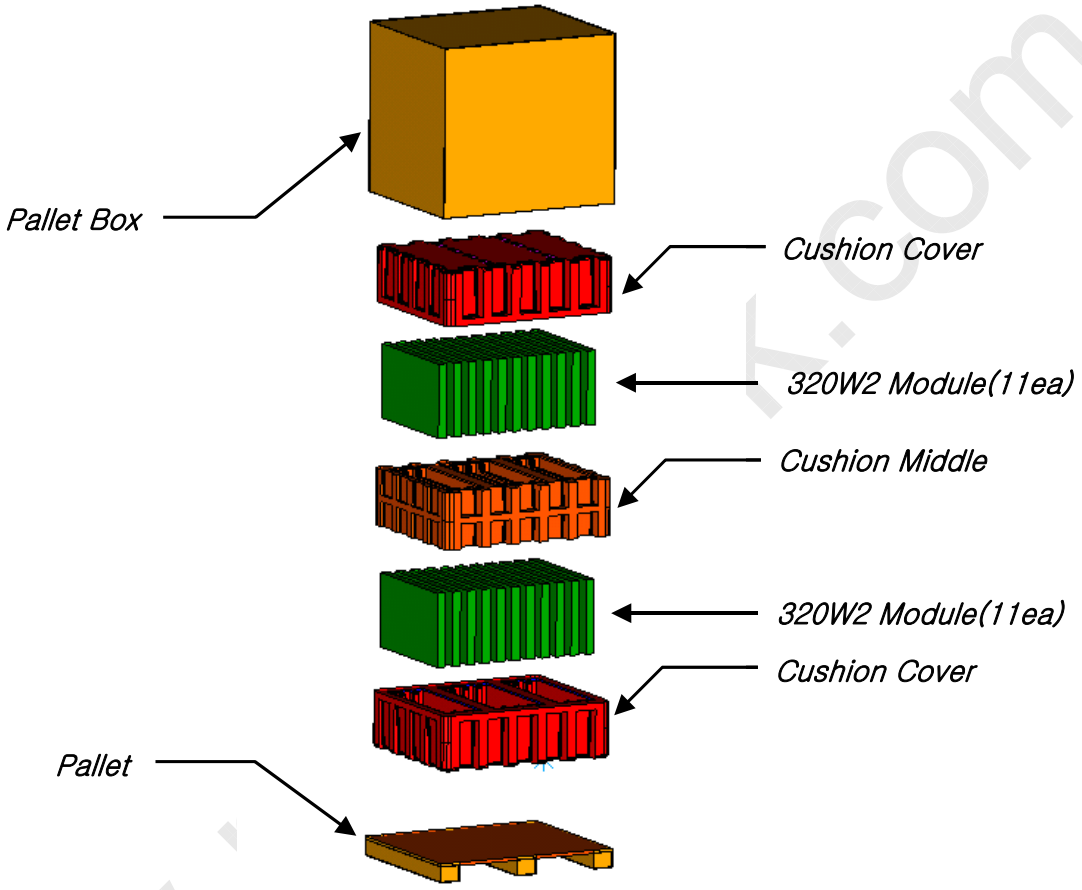
8. PACKING

8.1 CARTON(Internal Package)

(1) Packing Form

Corrugated fiberboard box and corrugated cardboard as shock absorber

(2) Packing Method



8.2 Packing Specification

ITEM	Specification	Remark
LCD Packing	22ea / Box (Packing-Pallet Box)	1. 7.0kg/LCD 2. 4.0kg/Cushion Cover(2ea) 3. 4.4kg/Cushion Middle(1ea) 4. 8.8kg/Packing-Pallet Box(1ea) 5. Cushion Material : EPS 6. Packing Pallet Box Material : DW4
Pallet	1 Box/Pallet	1. Pallet weight : 7kg 2. 176kg/Pallet , Total : 183kg/Pallet
Packing Direction	Vertical	
Pallet Size	H x V x Height	1150mm(H) x 985mm(V) x 1150mm(Height)

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9. MARKING & OTHERS

A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

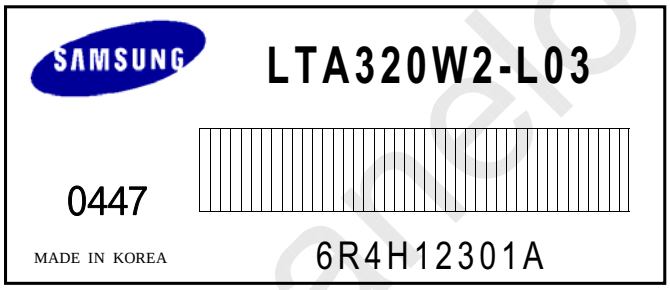
(1) Parts number : LTA320W2-L03-00R6
1 2 3 4 5 6 7 8 9

① LTA : AV model
② 320 : Panel Size
③ W : WXGA
④ 2 : Generation
⑤ L : LVDS
⑥ 03 : Derivation No.
⑦ 0 : Customer Code
⑧ 0R : Revision No.
⑨ 6 : Line

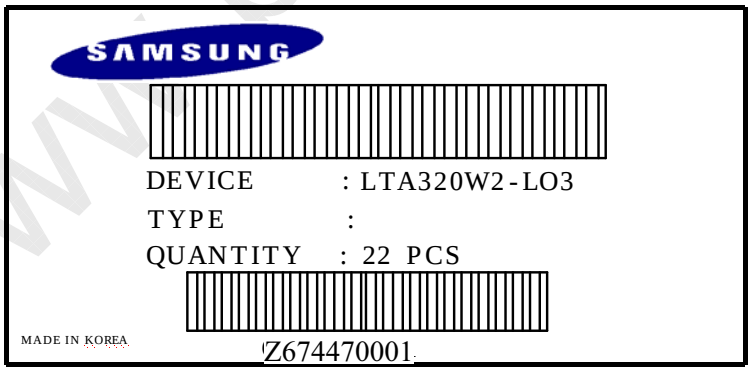
(2) Lot number : 6 Y 4 H 123 01 A
1 2 3 4 5 6 7

① 6 : Line
② Y : Device
③ 4 : Year
④ H : Month
⑤ 123 : LOT No.
⑥ 01 : GLASS No.
⑦ A : CELL No.

(3) Nameplate Indication



(4) Packing Pallet Label



Z 6 7 4 4 7 0 0 0 1
1 2 3 4 5 6

① Z : PALLET
② 6 : LINE
③ 7 : CITE CODE
④ 4 : YEAR
⑤ 47 : WEEK
⑥ 0001 : SERIAL No.

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10. General Precautions

10.1 Handling

(a) When the module is assembled, It should be attached to the system firmly using every mounting holes. Be careful not to twist and bend the modules.

(b) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and CCFT back-light.

(c) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.

(d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, Staining and discoloration may occur.

(e) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

(f) The desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane.
Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(g) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.

(h) Protect the module from static , it may cause damage to the CMOS Gate Array IC.

(i) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(j) Do not disassemble the module.

(k) Do not pull or fold the lamp wire.

(l) Do not adjust the variable resistor which is located on the module.

(m) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(n) Pins of I/F connector shall not be touched directly with bare hands.

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10.2 Storage

(a) Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35C and relative humidity of less than 70%.

(b) Do not store the TFT-LCD module in direct sunlight.

(c) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

10.3 Operation

(a) Do not connect,disconnect the module in the "Power On" condition.

(b) Power supply should always be turned on/off by the item 6.3 "Power on/off sequence"

(c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

(d) The cable between the back-light connector and its inverter power supply shall be a minimized length and be connected directly . The longer cable between the back-light and the inverter may cause lower luminance of lamp(CCFT) and may require higher startup voltage(Vs).

10.4 Operation Condition Guide

(a) LCD product supposed to be operated under circumstance of normal condition.
Normal condition is defined as below;
- Temperature : 20±15℃
- Humidity : 65±20%
- Display pattern : continually changing pattern (Not stationary)

(b) When the product is used for special application where operates LCD products in a special condition - sever then normal temperature or humidity or operation time or display pattern -that may happen at Airport, Transit Station, Stock market, Bank, and Controlling system Etc, please contact SEC and take application AMLCD engineers advice. Otherwise, it may not be guaranteed its life time and function.

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10.5 Others

(a) Ultra-violet ray filter is necessary for outdoor operation.

(b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.

(c) Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the module may be damaged.

(d) If the module displays the same pattern continuously for a long period of time,it can be the situation when the image "Sticks" to the screen.
We recommend that you should discuss SEC when you want the module to be operated in displaying the same pattern for a long time.

(e) This module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.

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